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NASA TECH BRIEF

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Aluminum Doping Improves Silicon Solar Cells

The problem:

To devise a shallow-junction solar cell having a broad spectral response, high efficiency, and a long lifetime in nuclear radiation environments.

The solution:

Aluminum-doped silicon solar cells with resistivities in the 10- to 20-ohm-centimeter range.

How it's done:

The cells are made by a standard diffusion process at temperatures of approximately 800°C, using a high-purity aluminum-doped silicon. The sheet resistance of the diffused layer is kept at or below 200 ohms per square, and 10 grid fingers on the top surface of the cell permit attainment of curve power factors of 70% for this value of sheet resistance. Depending on the application, the cell thickness can vary between 0.008 and 0.020 inch. A special, antireflective superblue coating increases spectral response which increases resistance to radiation damage.

Notes:

1. Application advantages of these cells are: (1) extremely shallow junctions with improved junction characteristics, resulting in better curve power factors, broader spectral response, and higher efficiencies; (2) relatively high resistance to nuclear radiation damage.
2. Production advantages of these cells are: (1) low material rejection and increased production yields; (2) close-tolerance control; and (3) ease of applying superblue coatings to improve the spectral response and radiation resistance of the cells.
3. Further information concerning this innovation is given in: NASA TN D-2711, "Effects of Impurities on Radiation Damage of Silicon Solar Cells," by Joseph Mandelkorn et al, available from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia, 22151.
4. Inquiries may also be directed to:

   Technology Utilization Officer
   Lewis Research Center
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   Reference: B66-10181

Patent status:

No patent action is contemplated by NASA.

Source: (Lewis-206)

Category 02